MONTANA DEPARTMENT OF FISH, WILDLIFE & PARKS

FISHERIES DIVISION

JOB PROGRESS REPORT

State: Montana Title: Southwest Montana Fisheries Study

Project No.: F-9-R-29 Title: Inventory and Survey of the Water of

Job No.: Ia Gallatin and Madison Drainages

Project Period: July 1, 1980 through June 30, 1981

Report Period: April 1, 1981 through June 30, 1981

ABSTRACT

Brown and rainbow trout population estimates were calculated for the Gallatin River at Logan for both the spring and fall periods. Comparison of spring and fall brown trout populations show a 18.9% increase in biomass of trout one-year-old and older. The summer mortality rate for two-year-old and older brown trout was 65.6%. Comparison of two-year-old and older brown trout from the fall of 1979 to the fall of 1980 shows a 27.6% decrease in numbers.

Discharge of the Gallatin River at Logan was monitored. The minimum flow occurred on July 30 and it was 369 cfs. This discharge was considered to be less than optimum for the fishery.

Wild brown and rainbow trout population estimates were made for the Hoffman Ranch section and data will be included in a future report.

BACKGROUND

The East Gallatin River flows through both a heavily developed agricultural and urban area (City of Bozeman). The City of Bozeman discharges treated sewage effluent into the East Gallatin River near its source. Other urban runoff effluents such as storm sewers have direct access to the East Gallatin River via tributaries, such as Sourdough Creek. Industrial wastes and septic tanks, not yet hooked up to city facilities, may also effect the river fishery.

The Gallatin River is one of Montana's excellent trout rivers. The upper reaches are considered of Blue Ribbon quality and receive enough angler pressure that trout population size and age structure may be altered reducing its quality as a larger trout fishery. The lower reaches are not nearly as well known, but do support 3,900 angler days of fishing (1975). The lower river is impacted severely by the almost total annual dewatering of the Gallatin River above the confluence with the East Gallatin River.

OBJECTIVE AND DEGREE OF ATTAINMENT

1. To determine fish populations, species composition and growth rates for two sections on the East Gallatin and one section on the Gallatin River near Logan (data will be included in a future report).

2. To obtain water temperature and water flow data on a section of the Gallatin River near Logan (data included).

3. To determine the success of planting 1-2 inch rainbow versus 4-6 inch rainbow by gill net sampling on Harrison Reservoir (data will be included in a future report).

4. To obtain fish population data and run IFG-4 program to determine fishery-flow needs on selected rivers or tributaries as time permits (data will be included in a future report).

PROCEDURES

Electrofishing gear was used to sample fish populations in the East Gallatin and upper Gallatin Rivers. Electrofishing was conducted by floating through the section in a fiberglass boat utilizing a mobile positive electrode. Fish populations in the lower Gallatin River were electrofished using fixed positive electrode mounted on a boat. Population estimates were made by using the Peterson mark-and-recapture method. Usually, a 10-15 day period was allowed between marking and recapture trips. Captured fish were measured to the nearest 0.02 pound and 0.1 inch. Scales were taken (1.0 per 0.5 inch) to determine age and growth rates. Mathematical computations were made by a computer programmed to use methods described by Vincent (1971a and 1974).

FINDINGS

Gallatin River

Manhattan-Logan Section

This study section (Figure 1) was shortened slightly before the spring of 1980 sampling was conducted. It originally ran from Nixon Bridge at Manhattan to the county bridge west of Logan. Due to problems consistently encountered above the very end of this section, the section was altered to end at the Burlington Northern Railroad Bridge at the west edge of Logan. This shortened the section from 5.6 miles to 5.0 miles.

Trout population estimates are given in Tables 1 and 2.

Table 1. Comparison of spring and fall 1980 brown trout population estimates for the Manhattan-Logan Section of the Gallatin River (80% confidence intervals).

SPRING				FALL			
Age	Average Length	Number	Biomass (lbs)	Age	Average Length	Number	Biomass (lbs)
I	5.7	800	54.7	I	9.1	1363	396.2
II	10.0	1948	696.7	II	12.1	701	471.1
III	14.3	363	370.3	III	14.9	286	364.3
IV	16.1	247	351.1	IV	16.5	186	318.5
V+	17.8	71	139.6	V+	17.9	168	367.2
Total		3429 ($\pm$667)	1612.4 ($\pm$254)	Total		2704 ($\pm$400)	1917.3 ($\pm$412)

Figure 1. Map of the Gallatin River Study Section (Manhattan-Logan 5.0 miles).

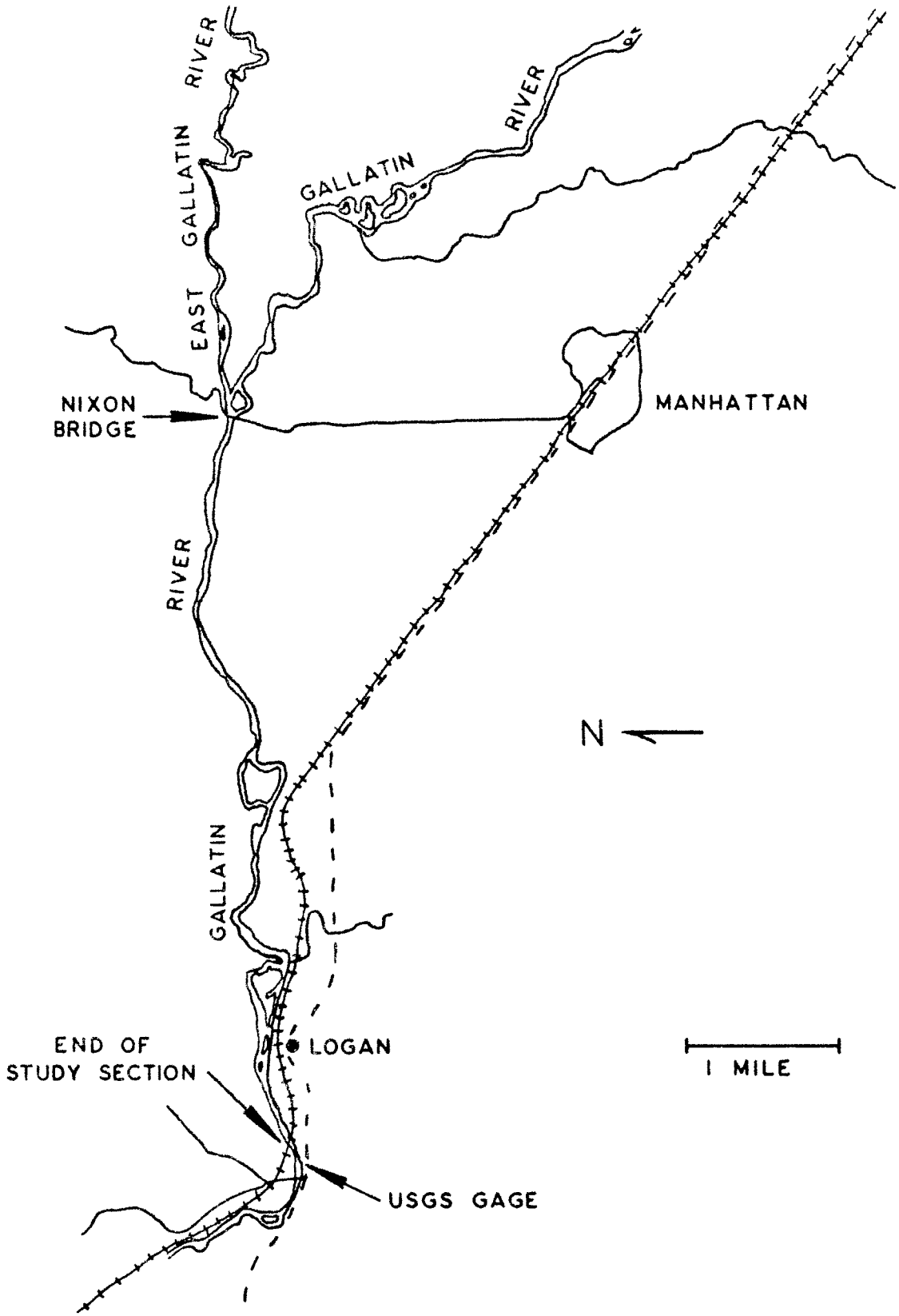

Table 2. Comparison of spring and fall 1980 rainbow trout population estimates for the Manhattan-Logan Section of the Gallatin River (80% confidence intervals).

Age	Average Length	Number	Biomass (lbs)	Age	Average Length	Number	Biomass (lbs)
I	5.3	753	49.9	I	9.1	5095	1547.9
II	9.9	673	243.4	II	11.2	1698	945.5
III	12.1	658	430.7	III	13.5	529	506.8
IV	13.7	385	364.8	IV+	15.4	463	677.6
V+	16.0	144	233.6				
Total		2613 ($\pm$467)	1322 ($\pm$260)	Total		7785 ($\pm$2874)	3677.8 ($\pm$1081)

The population estimates per mile for each species are given in Tables 3 and 4.

Table 3. Brown trout estimates per mile by age class for the Manhattan-Logan Section of the Gallatin River.

Age	Fall 1979 Number/Mile	Spring 1980 Number/Mile		Fall 1980 Number/Mile
II	126	390		140
III	182	73		57
IV	61	49		37
V+		14	*	33
Total	369	526		267

*Show estimates that have unexplained recruitment.

Table 4. Rainbow trout estimates per mile by age class for the Manhattan-Logan Section of the Gallatin River.

Age	Fall 1979 Number/Mile	Spring 1980 Number/Mile	Fall 1980 Number/Mile
II	--	--	340
III	--	132	106
IV	--	77	93
V	--	29	
Total		238	539

Reliable population estimates appear to be feasible after brown trout reach age II (10.0") and rainbows have had a minimum of three growing seasons (Age II in fall, 11.2" in length). The only exception to this are the large brown trout estimated in the fall. Sampling at that time is normally accomplished by low, warm water which severely impairs sampling. The Gallatin River in this section has some very deep water that could offer large trout higher security during periods of dewatering. If large brown trout are concentrated in very deep water, random sampling would be difficult and could result in invalid estimates. Another possible explanation could be early movement associated with brown trout spawning.

Mortality rates available are given in Table 5.

Table 5. Annual mortality rates for brown trout in the Manhattan-Logan Section of the Gallatin River (Fall, 1979 to Fall, 1980).

Age	Number Per Mile	Age	Number Per Mile	Annual Rate of Mortality Fall '79 to Fall '80
II & older	369	III & older	127	65.6%
III & older	243	IV & older	70	71.2%

Total annual mortality rates for these two age groups of brown trout appear high. Angler caused mortality is certainly not the main factor. Winter flows of the Gallatin River appear near normal. Summer discharge

approximates the norm as well, though it is below the 850 cfs instream flow recommended. This situation will have to be monitored in the years ahead to achieve an explanation. A spring to spring annual mortality rate will be calculated in the next report.

During four electrofishing seasons to date, numerous difficulties were encountered sampling the Gallatin River. These difficulties lead to rather extended mark and recapture periods. It is recommended that other electrofishing techniques be investigated to assure less costly data gathering, as well as an uninterrupted source of data.

Growth of brown trout from spring to fall 1980 appears quite good. One area of concern is that the average length of age II fish in the fall does not closely agree with the average length of age III fish in the spring (nearly all of the growth period was complete at the time of the fall estimate). A similar situation occurs with the age III to age IV fish as well. Since more difficulty is encountered in reading fall brown trout scales (probably due to the onset of spawning condition), possible errors could be at fault.

A similar, but less dramatic, situation exists with the rainbow trout.

Growth of both brown and rainbow trout appear comparable to other rivers in the area (Jefferson, Missouri). As is the case elsewhere, brown trout growth rates exceed those of rainbow trout (especially after the third growing season).

Discharge-Temperature

Mean monthly discharge of the Gallatin River at Logan is given in Table 6 (Upper Missouri River Basin, Technical Paper, 1978).

Table 6. Mean monthly discharge of the Gallatin River at Logan.

Month	Mean Discharge (cfs)	Month	Mean Discharge (cfs)
October	752	April	1034
November	809	May	2081
December	749	June	2962
January	684	July	960
February	704	August	472
March	788	September	645

Mean daily discharges for 1980 are given in Appendix Table 1. The lowest mean daily flow occurred on July 30, August 7 and August 8 (369 cfs). The recommended instream flow based on wetted perimeter measurement on riffles is 850 cfs. During the July 15 through September 15 period (63 days), all but 1 day was below the recommended 850 cfs level. This situation is very undesirable because of its impact on invertebrate production, fish security related to overhead vegetative cover, and indirect thermal addition. A solution to this situation is unlikely.

Water temperature was not collected due to lack of functional recorders.

Appendix Table 1. Gallatin River mean daily discharge (cfs), March through September, 1980 (U.S.G.S.).

Day	March	April	May	June	July	August	September
1	745	790	2530	2830	1770	414	555
2	754	797	2560	2740	1600	420	580
3	759	790	2450	2620	1600	409	592
4	718	797	2620	2400	1770	420	580
5	690	865	2530	2260	1620	399	561
6	718	944	2540	2310	1490	384	543
7	684	912	2900	2460	1330	369	537
8	677	834	2960	2260	1210	369	611
9	670	842	3070	2240	1190	379	637
10	684	873	3250	2360	1110	384	611
11	842	850	2890	2660	1020	384	704
12	904	842	2460	3230	873	369	857
13	775	880	2120	3290	812	379	819
14	790	985	1860	3190	812	414	819
15	944	1080	1690	3290	690	414	827
16	775	1080	1600	3500	617	441	812
17	711	1090	2000	3160	549	430	812
18	725	1220	1990	3100	513	420	768
19	768	1320	1940	3060	468	468	812
20	753	1550	2130	3200	468	519	797
21	782	1910	2570	3550	474	513	870
22	782	1900	3200	3400	435	496	830
23	812	2070	3700	3200	414	513	760
24	782	2130	3590	2900	420	496	810
25	790	2270	4060	2700	425	479	800
26	746	2370	4080	2500	414	474	780
27	746	2320	3140	2410	404	485	800
28	761	2280	2730	2180	389	537	800

Appendix Table 1. (continued)

Day	March	April	May	June	July	August	September
29	797	2360	2520	1930	374	549	815
30	888	2480	2700	1810	369	531	820
31	790		2890		399	543	
Mean	767	1381	2686	2758	840	445	731

East Gallatin River

Wild brown and rainbow trout population estimates were made for the Hoffman Ranch section for spring (March) and fall (Sept.) periods for 1981. Data will be included in a future report.

LITERATURE CITED

Vincent, E. R. 1971a. River electrofishing and fish population estimates. Prog. Fish Cult.

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